THE DENTAL PRACTITIONER

AND DENTAL RECORD

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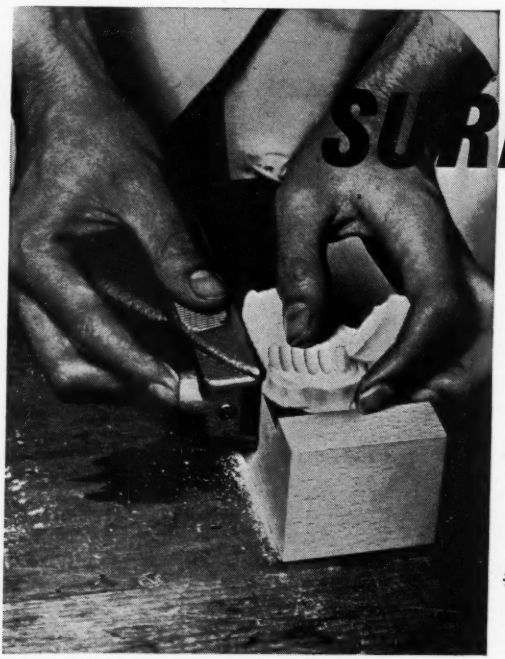

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THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. XI, No. 4 December, 1960

EDITORIAL

TREATING ACCIDENTS

THE continuing number of road and industrial accidents highlights from time to time the question of whether there is an adequate accident service in the country to deal with them. These problems have not in the past received any great thought on the part of those responsible for maintaining the health service. It is therefore gratifying to find that in the London area discussions are in progress regarding the formation of four Regional Accident Services. As with all new ideas where local institutions are involved, there also arises the question of local responsibilities and the necessity for a broader view for the general effectiveness of the scheme as a whole.

How will it work? While in detail the scheme is still under discussion, the broad outline is as follows: The injured will first be dealt with by a first-aid service followed by speedy transportation to accident centres having adequate equipment. The centres will have beds available to accommodate up to fifty patients at a time and a full medical and surgical staff, working closely together, available day and night. Since facilities for these accident centres and adequately trained general surgeons do not exist in every hospital or in every district, we will expect to see certain hospitals allocated to provide these facilities where all accident cases will be taken, thereby by-passing many existing casualty departments. Regrettable as this may seem to some, it will in all probability provide better treatment for greater numbers in the long run. The normal casualty clinics in hospitals will be dealing only with minor injuries and emergency illnesses.

While THE DENTAL PRACTITIONER applauds the establishment of such accident centres, it also feels it important that those responsible for providing this service should not forget that a high proportion of injuries on the road and in industry* occur to the head and face and associated structures. Therefore a competent team of maxillo-facial surgeons and prosthetists must be included in the set-up of the surgical teams. These specialist teams already exist in the dental schools and, as some of them will not be associated with the hospitals involved in the accident service, they might be considered for this purpose. To-day, with the increasing number of trained dental registrars, it would not be difficult for dental teams, together with student dressers, to be in residence on a rotational basis in the centres concerned.

And what an opportunity—at present non-existent—for students to gain practical experience in emergency dental surgery and the highly specialized treatment of accidents.

Surely an opportunity not to be missed.

* See Abstract, p. 136.

TREATMENT OF A CASE OF ACUTE OSTEOMYELITIS WITHOUT SURGICAL INTERVENTION

By **R. BOLTON**, B.D.S., L.D.S., F.D.S. R.C.S.
City General Hospital, Stoke-on-Trent

DURING the last 20 years the incidence and treatment of acute osteomyelitis of the jaws have been considerably affected by the advent of the antibiotics. The use of these drugs in acute dental infections has to a large extent eliminated the fear of the condition as a complication, and in established cases of osteomyelitis the use of antibiotics has revolutionized the course of the disease.

Whereas Mitner and Wolfe (1934) were able to review 85 cases between 1922 and 1932, in a similar period most dental surgeons in the Hospital Service to-day would not see more than a fraction of this total which exhibited the typical moth-eaten appearance of the bone on X-ray.

HISTORY OF TREATMENT

At the end of World War I osteomyelitis of the mandible was treated mainly by one of three methods:—

1. Baer method, involving the introduction of sterile maggots into the area, the maggots being the larvæ of the blowfly.

2. Carrel-Daken drip technique, whereby 1 : 100 solution of hypochlorite was continually used to irrigate the area.

3. Orr technique, whereby the wound was packed with petroleum jelly gauze and the jaw immobilized in a plaster cast.

Attempts were made at producing the therapeutic effect of the maggots as used in the Baer technique, since they were not always successful or practical in the oral cavity. Thus calcium picrate, allantoin 4 per cent, and urea 1 per cent were introduced into the irrigating solutions to the area. The latter two are excretory products of maggots and have the action of digesting and dissolving organic debris. Urea in particular is said to have a marked effect on purulent lesions and infected wounds, necrotic material is cleared, odour lessened, and healthy granulations form.

In the 1930's fractional erythema doses of X-rays were used to promote healing. Doses in the region of 100 r per treatment were used and 1 to 3 treatments given. The danger of using X-rays and development of osteoradio necrosis prevented the treatment becoming popular.

Nearly all writers about this period stressed the need for conservative treatment, i.e., no surgical intervention to be carried out apart from ensuring good drainage. Tratman (1934), Read (1936), and Hankey (1938) are among the numerous advocates of conservatism.

Briefly, the conservative approach consisted of incising when pus had localized, hot mouth-washes, hot external applications when it was obvious that pus was pointing, and irrigation with one of the previously mentioned solutions. Through-and-through drainage was obtained, and some operators drilled holes through the cortical bone to relieve the tension of pus in the medullary area. Extractions and curettage of sockets were contra-indicated in order to prevent the spread of infection. As sequestra formed they were lifted out. With this line of treatment, sequestra would continue to form for months or even years after the onset of the disease.

Mitner and Wolfe (1934) were the first advocates of the radical approach to the disease. With the advent of the antibiotics towards the end of World War II the method of treatment swung mainly from the conservative approach to radical surgery.

Mowlem (1945), Thoma, Holland, Woodwry, and Burrow (1948), Thoma (1954), Wass (1949), Stuteville (1950), and Heslop and Rowe (1957), all used the surgical approach. Stuteville also used bone-chips and metal plates to

bridge the deficiency created following surgery, and reported good results.

The radical approach consisted of a submandibular incision, removal of the outer plate and lower border of the mandible in the diseased area, followed by thorough curettage until only healthy bone remained. The soft tissues were then allowed to collapse over the wound. Penicillin systemically, and locally via irrigation tubes, was administered. A waiting period of 3 weeks was advised after diagnosis of acute osteomyelitis and before operation to avoid the risk of fulminating septicæmia.

Allwright (1953) suggests in his most comprehensive paper on the subject that an intra-oral approach can be made in most instances, thus avoiding an external scar.

A few papers have been written on the treatment of osteomyelitis using antibiotic therapy alone. Karpawich (1949), Cahn (1950), and Whitfield (1953) report such cases with excellent results.

Thus, although the combination of surgery and antibiotics offers the most certain and rapid cure, the fact that cases have been reported with minimal or no surgery, but only antibiotic therapy, illustrates that in selected cases this form of treatment is worthy of trial.

Fig. 1.—Showing the original condition.

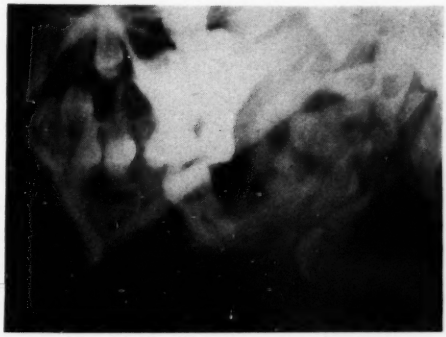

Fig. 2.—Showing X-ray taken 6 weeks after the onset of the condition.

Fig. 3.—Showing X-ray taken 16 weeks after the onset of the condition.

Fig. 4.—Showing X-ray taken 70 weeks after the onset of the condition.

CASE REPORT

A 29-year-old married woman was referred to the Dental Department of the City General Hospital, Stoke-on-Trent, by her doctor.

She gave a history of having had $\overline{865}|$ extracted by her practitioner whilst an acute alveolar abscess was present on the $\overline{8}|$. Her face continued to swell following the extractions and she was eventually referred to her doctor for a course of penicillin injections.

On the third day of the course she was involved in a car accident and was admitted to a nearby hospital, unconscious, regaining consciousness shortly after

admission. She had a small laceration of the right parietal region and a hæmatoma of the left temporal region, a large swelling was present in the right submandibular region, and there was a temperature of 101° F. She was given 500,000 units of soluble penicillin 6-hourly for 10 days, and then discharged home as the swelling and temperature had returned to normal Two and a half weeks after she had been discharged from hospital her submandibular swelling reappeared. She visited her doctor who referred her to the Dental Department.

On Examination.—She was found to have a hard, non-fluctuating swelling over the right side of her face. Marked trismus, paræsthesia of the right inferior dental nerve, and a slightly elevated temperature (99·6° F.) were present. X-rays showed an extensive area of osteomyelitis of the ascending ramus and body of the mandible up to the $\overline{6}|$ region (*Fig.* 1). A fracture of the right condyle was also present, presumably due to the road accident. The patient was admitted to hospital, and crystamycin 1 vial b.d. was given intramuscularly. One week later the swelling and trismus had almost gone and the temperature was normal. She was discharged from hospital, but attended for two daily injections of crystamycin for a further week. Following this she attended for a further 10 weeks for 1 daily injection of 1 vial crystamycin.

At this stage the radiological appearance shows (*Fig.* 3) that there had been further bony consolidation in the ascending ramus, although there were still a few small sequestra present in the area. The sequestrum in the $\overline{6}|$ region had decreased in size.

In her follow-up two months later she reported a tender spot in the alveolus in the $\overline{6}|$ region. There was some hyperæmia present. Hot saline mouth-washes were prescribed. Two days later a loose sequestrum was removed from the area and the hyperæmia rapidly subsided. X-rays showed that the small sequestrum in the $\overline{6}|$ area had disappeared. Twelve months later the patient was recalled for check X-rays. These showed that there had been further improvement and the regeneration of bone was almost completed.

X-rays of the case were, of course, too numerous to include a complete follow-up in this article, so a series of four lateral obliques are shown (*Figs.* 1–4).

Note the gradually increasing consolidation of bone over the series. Of particular interest is the sequestrum in the $\overline{6}|$ region, which gradually reduces in size until it is exfoliated at 20 weeks. In *Fig.* 4 the spot where this sequestrum was present can still be seen by the incomplete regeneration despite the fact that the rest of the ascending ramus appears normal.

COMMENTS ON TREATMENT

The conservative approach was provisionally selected in view of the age and sex of the patient in the hope that any scar or deformity could be avoided. No pus was available to carry out antibiotic sensitivity tests.

Crystamycin (Sodium Penicillin G 500,000 units, Streptomycin as sulphate 0·5 g. per vial) was used for the following reasons.

A long course of the antibiotics was anticipated which ruled out the use of the broad spectrum antibiotics because of the frequent unpleasant side effects, and streptomycin alone because of the possibility of VIIIth nerve damage and the onset of resistant strains. It was thought that penicillin alone might not be effective in view of the previous course given and the possibility, therefore, of resistant strains.

Crystamycin is effective against both Gram-positive and Gram-negative organisms, and the two antibiotics are synergistic against a large number of bacteria. Resistant strains are delayed and the side effects of streptomycin minimized by the relatively low dose given in combination, as opposed to using this drug alone.

Rapid response to the drug enabled the patient to be sent home in one week, and as she lived near the hospital it was convenient for her to attend for a further week twice a day and later once daily until radiological improvement of the condition at 12 weeks seemed sufficiently satisfactory to discontinue it.

It is interesting to speculate why the conservative approach fails when an inadequate course of antibiotics is given.

Bone-bank bone, as used for grafting operations, is non-vital but sterile. Sequestra contain bacteria in the bone spaces and are, therefore, non-vital and infected. The bacteria in these spaces are inaccessible to antibiotics much as bacteria in the root canals of non-vital teeth are unaffected by systemic antibiotic treatment.

However, if the sequestrum surface is bathed in antibiotic containing tissue fluid, sensitive bacteria on the surface will succumb.

If sequestration does not occur then resorption will. This is clearly shown on the serial X-rays of this case particularly relating to the sequestrum in the $\overline{6}|$ region and confirmed by a similar occurrence in Whitfield's (1953) case. As resorption of the sequestrum takes place, pockets of bacteria will be opened up, and provided sensitivity to the drug remains, will be destroyed. If, however, it has been discontinued the bacteria may multiply and an acute flare-up results.

In the case presented even with 3 months' antibiotic cover, one very minor sequestration

took place in the $\overline{6}|$ region. Perhaps if the treatment had been further prolonged even this would not have occurred. It is possible, therefore, that if the surface of the sequestrum can be kept free from bacteria until complete resorption of it occurs, it may well act as a bone-chip in a bone-graft and no sequestration will occur.

It is not the purpose of this article to suggest that antibiotic treatment will replace surgery in the treatment of osteomyelitis. No amount of antibiotic therapy will clear up a pocket of pus once it has formed and surgical intervention is then necessary. It does, however, set out to show that in suitable cases the conservative approach to the disease deserves consideration. It is superior when successful to the results obtained in the radical approach, in relation to the cosmetic appearance and possible future prosthetic difficulties. It does, however, take longer to obtain a result, and this must be taken into consideration when planning treatment.

SUMMARY

1. A review of the treatment of osteomyelitis over the past 40 years is given.

2. A case is presented which was treated by crystamycin alone without surgical intervention.

3. It is thought that if the dose of antibiotics is continued for a sufficiently long period in a suitable case, sequestration will be minimal and surgical intervention not required.

Acknowledgement.—I wish to thank Mr. W. B. Hales, Consultant Oral Surgeon to the Stoke/Stafford Groups of Hospitals, for permission to publish this case and also for help in preparing the article.

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Acute Cheilitis: an Unusual Effect of Preludin

Preludin (phenmetrazine hydrochloride, 3-methyl-2-phenylmorphaline hydrochloride) is an anorexic agent used in the treatment of obesity to make a restricted diet more tolerable, doses of 25 mg. t.d.s., taken 30–60 min. before meals, being usually adequate. Treatment should not be continued for more than a few weeks. Large doses and prolonged treatment may lead to habit formation and severe mental depression.

The following is an interesting example of an unusual secondary effect:—

A 38-year-old female dental practitioner presented complaining of swelling and severe burning sensation of the lips. Movements of speech and swallowing caused pain. The patient was 5 ft. $\frac{3}{4}$ in. tall, weighed 165 lb., and was dyspnœic on exertion. She had been taking preludin for four months. The initial dose of one tablet taken twice daily was reduced to $\frac{1}{4}$ tablet per day, but tinnitus, nausea, and malaise persisted. In addition lethargy, lassitude, loss of memory, and somnolence supervened. Minimal use of lipstick caused severe exacerbation of the lip symptoms.

On examination the lips were swollen, reddened, dry, and fissured. No other physical signs were found.

The reduced dose was abandoned for one week. Within three days the swelling was normal. The symptoms re-appeared two days after dosage was resumed, and subsequent cessation caused their disappearance. No other aetiological factors could be found. In view of the relation between the drug and the condition, a diagnosis of acute cheilitis due to preludin was made.—VALYI, E., and BANOCZY, Y. (1960), *Rev. Stomat.* (Paris), **61**, Nos. 1–2.

M. PLEET

THE DENTAL CONDITION OF SCHOOL CHILDREN

BASED ON A STATIC CROSS-SECTION SURVEY OF CHILDREN FROM SALFORD

By **J. A. HARGREAVES**, L.D.S.

Assistant Lecturer in Dental Surgery, University of Manchester, and Dental Officer, City of Salford

INTRODUCTION

FEW surveys have been undertaken of the "dental conditions" of children in the British Isles. The figures available suggest that the incidence of dental caries since the war has been steadily increasing (Mellanby, Martin, and Barnes, 1958), and consequently the maintenance of sound dental health of the child is a growing and continual problem.

OBJECT OF INVESTIGATION

It was decided, therefore, to examine three age-groups of children, namely 5-, 8-, and 12-year-olds, to ascertain the caries incidence and the main sites of dental decay within the developing dentition, to examine the health of the gingivæ, and also to study the incidence of malocclusion related to these conditions. Information on these subjects would greatly contribute towards the foundation on which to build sound preventive dental measures for the growing child.

MATERIAL

School children from Salford (a large Northern industrial city) aged 5, 8, and 12 years were selected from twenty of the schools situated in different residential parts of the city. One thousand three hundred and forty-eight children were examined during the months of September, October, and November, 1959, namely 424 5-year-olds, mean age of 5 years 6 months, 417 8-year-olds, mean age 8 years 6 months, and 507 12-year-olds, mean age 12 years 7 months. The 5- and 8-year-old groups were selected from primary, church, and council schools and the 12-year-olds from grammar and secondary modern schools. It was considered that the children selected were a cross-section of the Salford community.

STANDARDS OF DIAGNOSIS

1. Caries Incidence.—Dental caries was diagnosed according to Jackson (1950 a) using mirror and replaceable probe points (Miller and Atkinson, 1951). Two modifications were introduced in that the probe points were replaced after every ten examinations and the teeth were not pre-cleaned before the examination. In this survey one examiner, the author, skilled in the method described by Jackson (1950 a), carried out all the examinations.

2. Gingival Examination.—The examination was concerned with the condition of the gingival health of the children, and the following classification was compiled. The gingival condition about the lower anterior teeth, as suggested by Schour and Massler (1947), was used for these observations.

Good: A healthy clean condition with firm pink mucosa.

Fair: Slight rolling or loss of stippling of the gingival margin, but no bleeding detectable from probe examination or digital pressure.

Poor: Gingival inflammation of the mucosa, with bleeding observed from probe examination or from digital pressure.

3. Occlusion.—Normal occlusion is defined as being a good arch form with all teeth in good relation to adjacent as well as opposing teeth (Gardiner, 1956). Malocclusion can be expressed as any departure from normal occlusion. The classification of Angle (1907) was used to express the anteroposterior relationship of the dental arches; Class II and Class III relationships being where the lower arch lay half a cusp or more mesial or distal to the upper arch. Faciolingual and vertical relationships were also recorded. Mutilated dentition was recorded according to the

definition of Moorrees (1959), as the extraction of one or more first permanent or second deciduous molar teeth.

4. Clinical Eruption of the Permanent Teeth.—A tooth was considered to be erupted if any part of the crown was observed in the mouth (Hargreaves, 1958).

STANDARDS OF ASSESSMENT

1. Caries.—Several indices of caries incidence have been described; among them are the D.M.F. (decayed, missing, and filled) index of Klein and Palmer, the A.C.F. (average caries figure) of Mellanby, and the indices of Boedecker, Westin, and the Swedish Moulage System. The D.M.F. index is probably the most universally used and with its modification d.m.f. for deciduous teeth (Jackson, 1950 b), this was the standard selected. Both D.M.F. and d.m.f. are expressed as an average per 100 children. The level of occlusal, interproximal, and cervical caries was recorded and also the position of caries, premature loss of deciduous molars, and extraction of permanent teeth. The relation of D.M.F. to the residential environment and intelligence levels of the children from the different schools was compared. Food and sweet stuffs on sale at the various schools in relation to the D.M.F. index were also examined.

2. Gingival Examination.—This was expressed as a percentage incidence of good, fair, and poor, as described above and also related to the incidence of malocclusion.

3. Occlusion.—Normal occlusion, malocclusion, and mutilated dentitions were expressed as a percentage for the three age-groups.

4. The Eruption of the Permanent Teeth.—The number of individual permanent teeth which had erupted was recorded for each age-group. These numbers were expressed as a percentage of the expected number in the permanent dentition.

RESULTS

1. Caries in the Deciduous Dentition.—

a. d.m.f. Deciduous Teeth.—The findings from the 5- and 8-year-old children were used for this analysis (*Table I*). The results showed the boys to have a slightly higher d.m.f. total than the girls. The extracted teeth averaged 139 teeth per 100 children at 5 years. There were approximately three times this number for the 8-year-old group, with 405 teeth extracted per 100 children. The filled tooth fraction was constantly low with 21 filled teeth per 100 children at 5 years and 25 filled teeth per 100 children at 8 years. Eight per cent of the 5-year-old and 3 per cent of the 8-year-old children were caries free.

Table I.—d.m.f. Teeth per 100 Children

Age	Sex	d.	m.	f.	d.m.f.	S.D. per Child
5	M	598	148	21	767	1·02
	F	525	130	21	676	0·86
	Combined	561	139	21	721	1·04
8	M	416	365	22	803	0·86
	F	322	446	28	796	0·99
	Combined	369	405	25	799	0·91

b. Level and Location of Caries in the Deciduous Teeth.—The present results (*Table II*) indicate the occlusal and interproximal caries to be at a high level. At 5 years of age the ratio of occlusal caries to interproximal caries was 4 : 3. At 8 years of age the amount of caries was greater but the ratio of occlusal to interproximal lesions was now equal.

The location of caries in the deciduous teeth was also investigated (*Table III*) and the relationship of occlusal to interproximal caries was examined (*Table IV*). For occlusal caries at 5 years the relationship between the first deciduous and second deciduous molars was found to be 100 first molar to 126 second molar teeth. This ratio was lower in the 8-year-old group with 100 first molar to 118 second molar teeth. The ratio for interproximal caries at 5 years was found to be 100 first molars to 72 second molars, and at 8 years, 100 first molar to 101 second molar teeth. From these figures it could also be seen that at 5 years of age more occlusal cavities were diagnosed in the second molar tooth than the first, with the reverse for interproximal lesions. At 8 years of age the average number of occlusal cavities seen in the two teeth again showed more cavities to be present in the

second molar tooth than in the first but the numbers of interproximal lesions for the two teeth were now approximately equal.

2. Caries in the Permanent Dentition.—*a. D.M.F. Permanent Teeth.*—For this analysis the findings for the 8- and 12-year-old children were used (*Table VI*). The results for these age-groups showed the D.M.F. index for girls to be slightly higher than for boys.

Table II.—Level of Occlusal and Interproximal Caries

Age	d.m.f. Teeth per 100 Children	Occlusal Caries per 100 remaining Primary Molars	Interproximal Caries per 100 remaining Primary Molars	Interproximal Caries per 100 remaining Primary Incisors	Number of Extracted Primary Molars per 100 Children
5	721	60	45	14	102
8	799	70	70	—	368

c. Premature Loss of the Deciduous Molars.—At 5 years of age an average of 102 molar teeth per 100 children of the primary molars had been extracted. At 8 years of age this figure was 368 molar teeth per 100 children. This analysis was further divided up for the individual first and second deciduous molar teeth (*Table V*). From these results, at 5 years of age, more second molar teeth had been extracted than first molar teeth. For the 8-year-old group, the number of first and second molar teeth extracted was almost equal. The extracted teeth at 8 years averaged 15 teeth per 100 children and at 12 years 101 teeth per 100 children. The filled tooth fraction showed a similar difference between the two age-groups; at 8 years there was an average of 33 filled teeth per 100 children and at 12 years an average of 153 filled teeth per 100 children. Caries-free children formed 3 per cent of both the 8- and 12-year-old groups.

Table III.—Location of Carious Lesions in the Deciduous Teeth per 100 Children

Age	Sex	Interproximal Caries Molar Teeth			Occlusal Caries Molar Teeth			Interproximal Caries Anterior Segment	Buccal and Lingual Surface Caries
		D	E	DE	D	E	DE		
5	M	196	137	333	200	239	439	170	130
	F	165	123	288	171	227	398	142	105
	Combined	180	130	310	185	233	418	156	118
8	M	152	157	309	144	172	316	—	117
	F	149	145	294	133	154	287	—	77
	Combined	150	152	302	139	163	302	—	98

Table IV.—Relation of Interproximal to Occlusal Caries in the Deciduous Molar Teeth

Age	Tooth	Occlusal	Interproximal
5	First molar	100	97
	Second molar	100	56
	Combined	100	74
8	First molar	100	108
	Second molar	100	93
	Combined	100	100

Table V.—Premature Loss of Deciduous Molars per 100 Children

Age	Sex	First Deciduous Molar	Second Deciduous Molar
5	M	51	58
	F	46	50
	Combined	48	54
8	M	177	174
	F	195	192
	Combined	186	182

b. Level and Location of Caries in the Permanent Teeth.—A high level of caries, similar to that recorded in the deciduous dentition, was also found in the permanent dentition. At 8 years the percentage of first molar teeth decayed, missing, or filled was 69 per cent and the ratio of occlusal caries to interproximal caries was 100 : 4. At 12 years the percentage of first molar teeth decayed, missing, or filled was 86 per cent and the ratio of occlusal carries to interproximal caries was 100 : 31. In the 12-year-old group the majority of permanent second molar and premolar teeth had erupted and it was seen that for every 100 occlusal cavities in the first molar teeth there were 60 in the second molars and 26 in the premolars. The percentage of second molar teeth decayed was 38 per cent and premolar teeth decayed 17 per cent.

Table VI.—D.M.F. Teeth per 100 Children

Age	Sex	D.	M.	F.	D.M.F.	S.D. per Child
8	M	244	16	25	285	0·64
	F	246	15	42	303	0·68
	Combined	245	15	33	293	0·65
12	M	360	88	156	604	0·81
	F	385	120	149	654	0·94
	Combined	370	101	153	624	0·91

c. Extraction of the Permanent Teeth.—For both the 8- and 12-year-old age-groups the main tooth extracted was the first molar. It was found that at 8 years of age 15 permanent teeth per 100 children had been extracted with a ratio of 13 lower first molar teeth to 2 upper first molar teeth. At 12 years of age 101 permanent teeth per 100 children had been extracted with a ratio of 58 lower first molar teeth to 35 upper first molar teeth.

3. Relation of D.M.F. and d.m.f. to Environment within the City.—Twenty schools were examined and the D.M.F. and d.m.f. ratios were recorded for each school as described earlier. These schools were classed I, II, and III according to the immediate environment of the pupils who attended; Class I schools catering for children from small terraced type houses in the dock area of the City, Class II schools catering for children from private houses and modern council estates, and Class III schools catering for children from both these areas. These schools were arranged according to d.m.f. index and also individually for separate decayed, missing, and filled fractions and graphed against the selected environment coding. There was no obvious correlation between these two factors. The main observations noted, however, were that Class II schools had a higher f. (filled teeth fraction) compared with the d. and m. (decayed and missing teeth fraction).

4. Relation of D.M.F. to Educational Ability.—The findings from the 12-year-old children were analysed according to educational standards, i.e., whether they attended secondary modern or grammar schools. It was found that the children examined at the grammar schools had a lower D.M.F. index than the children at the secondary modern schools, but these findings were not statistically significant.

5. Relationship of d.m.f. and D.M.F. to Foodstuffs sold at Schools.—Controversy has recently been centred about the sales of foodstuffs at break periods in schools in respect of "dental health" of the children. Head Teachers from the Salford schools were asked what sales were undertaken at their schools from "tuck shops". Of 93 schools questioned, 61 had sales of foodstuffs which were mainly sweet or semi-sweet biscuits, but some schools did have sales of chocolate biscuits, sweets, and fruit drinks. Twenty of these schools were compared in respect of D.M.F. and d.m.f. against the average annual sale of foodstuffs per child. The annual sales per child had a range varying from 23s. 8d. to nil. No obvious connexion could be found between the D.M.F. index and food sales. The Head Teachers of these schools were mixed in their views of these sales. Among the points raised were that 20–25 per cent profit came from the sales, which was very helpful for school funds. Many of the children had inadequate breakfasts and biscuits sold with morning milk were a helpful added food for these children. Many children, before biscuits were sold at the schools, brought "large lunches" consisting

of cakes, sandwiches, and sweets to have with morning milk. The sale of biscuits provided a justification for banning these lunches and sweets being brought to school. Most schools

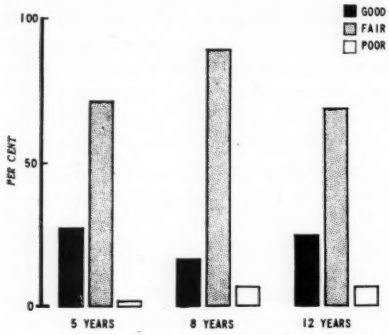

Fig. 1.—Gingival health of 1348 children examined.

imposed a limit to any child's expenditure on biscuits of one penny per day or sixpence per week. The staff allowed the sales of these

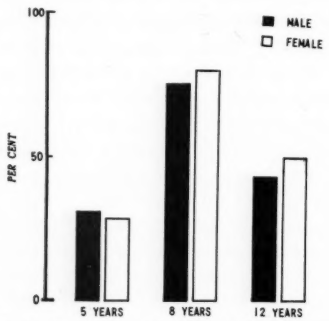

Fig. 3.—Percentage of mutilated dentitions.

biscuits to be undertaken by the children themselves which proved a useful activity for the older children.

6. Gingival Health Examination.—The findings for the gingival health of the children showed a healthier condition in girls than boys for all the age-groups. The fair condition was the predominant fraction (*Fig.* 1), comprising 71 per cent for the 5-year-old group, for the 8-year-old group 79 per cent, and for the 12-year-old group 68 per cent of the total examined.

7. Occlusion Examination.—The findings showed that normal occlusion predominated only in the deciduous dentition of the 5-year-old group (*Fig.* 2). The percentage of normal occlusions for the 5-year-old group was 57 per cent, for the 8-year-old group 37 per cent, and for the 12-year-old group 41 per cent. The percentage of Class II malocclusion was low

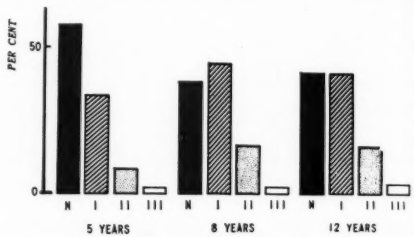

Fig. 2.—Percentage of normal dentitions and malocclusions. N, normal dentition; I, Class I malocclusion; II, Class II malocclusion; III, Class III malocclusion.

in the 5-year-old group, being 7·5 per cent. In the 8-year-old group the percentage was 16 per cent, and in the 12-year-old group 15 per cent. Class III malocclusions were constant for all three groups at approximately 2 per cent. Mutilated dentitions were at a high level for all age-groups (*Fig.* 3). The boys had a higher incidence in the deciduous dentition at 5 years and the girls a higher incidence in the mixed and permanent dentition at 8 and 12 years. The incidence of malocclusion was also compared with the gingival health examination (*Fig.* 4). It was seen that good gingival health conditions were associated with normal occlusion. In Class I and Class III malocclusions fair and poor gingival conditions were the main fractions, and Class II malocclusions were associated with poor gingival conditions.

8. Eruption of the Permanent Teeth.—The percentage of teeth erupted for each group was recorded (*Table VII*). The earlier eruption of the permanent teeth in the girls was constant throughout the examination. It was also noted that in the 8-year-old group the upper first premolar usually preceded the lower canine in boys, and the reverse sequence occurred with girls.

DISCUSSION

The figures obtained illustrate the incidence of caries, malocclusion, and gingival health within the developing dentition of the child. In a survey of this magnitude, bite-wing X-rays were not undertaken. Jackson (1950 a) suggested that X-rays in diagnosing caries were only a useful adjunct to the clinical method. Galagan and Vermillion (1956) more recently have shown possible error in caries detection from X-rays. Some degree of variation in diagnosis from clinical examination is unavoidable. This has been shown by Jackson (1950 a) and Vipeholm Dental Caries Study (1954) to be reduced if only one examiner undertakes the examination and the examiner be skilled and trained in the technique used. In this survey one examiner skilled in the method described by Jackson (1950 a) carried out all the examinations.

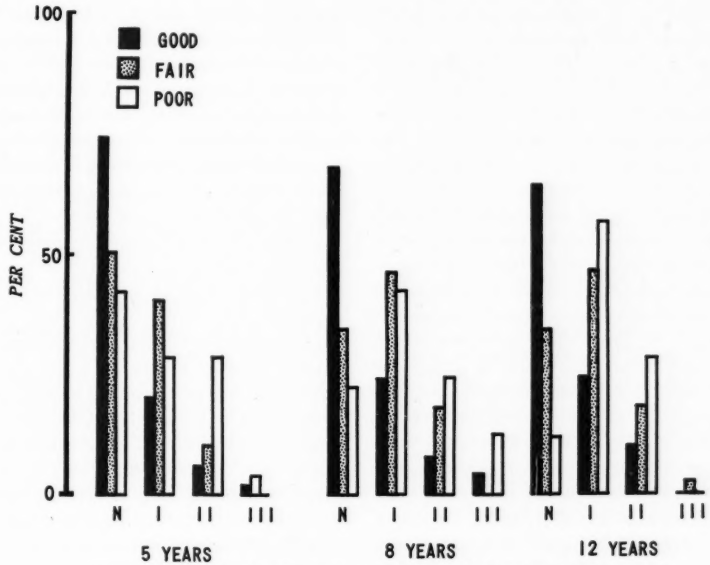

Fig. 4.—Incidence of malocclusion relative to gingival examination.

Table VII.—Percentage Permanent Teeth Erupted

Age	$\frac{\bar{6}}{}$		$\frac{\bar{1}}{}$		$\frac{6}{}$		$\frac{1}{}$		$\frac{\bar{2}}{}$		$\frac{2}{}$		$\frac{\bar{3}}{}$		$\frac{4}{}$		$\frac{\bar{4}}{}$		$\frac{5}{}$		$\frac{3}{}$		$\frac{\bar{5}}{}$		$\frac{\bar{7}}{}$		$\frac{7}{}$	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
5	19	28	15	23	15	18	2	3																				
8	100	100	100	100	100	100	95	99	89	97	56	76	2	17	8	14	2	8	4	5	1	3	1	2	0	0	0	0
12	100	100	100	100	100	100	100	100	100	100	100	100	98	100	95	97	88	97	86	89	88	95	76	85	80	89	70	83

Mellanby and Coumoulos, 1946; Mellanby, Coumoulos, and Kelly, 1957; Mellanby, Martin, and Barnes, 1958, have published work concerning 5-year-old children in the London area and have paid particular attention to the external surface tooth structure in relation to dental decay. They have shown that tooth structure in the average 5-year-old in 1943 and

1945 has improved compared with the examination of 1929. They also showed that at the end of the war the incidence of caries declined from 1943 to 1947, but rose after this date compared with future examinations up to 1955. This high caries level has also been shown by Parfitt (1956) in respect of a small number of 5-year-old children for whom he gives a d.m.f. figure of 723, the highest recorded for 5-year-old children in this country. This figure is almost identical to that shown in the present examination, as is the d.m.f. rate for the 8-year-old children, also shown by Parfitt. The position and development of carious lesions in the individual teeth are given. The increase of interproximal lesions in the second deciduous molar of the 8-year-old child would appear to be due to the eruption of the first permanent molar making a further contact area with the distal surface of this tooth. In the 5- and 8-year-old children, boys show a higher d.m.f. index than the girls. This fact was also noted by Miller (1950). Meredith (1946) has shown that the eruption of the deciduous teeth in boys is earlier than in girls, and this may have some bearing on these results. Miller (in press and personal communication) has suggested that the eruption of permanent teeth is occurring earlier than in pre-war years (Medical Research Council, 1925; Parfitt, 1955), and this view was confirmed within the three age-groups examined. This also could have some bearing on the higher D.M.F. figures for particular age-groups, the D.M.F. rate in the 8- and 12-year-old children showing a higher index compared with previous surveys (Miller, 1950; Jackson, 1952). A very high rate of premature tooth loss through extraction is dramatically shown; at 5 years of age 13 per cent of the molar teeth have been extracted and for the 8-year-old group 46 per cent have been extracted. Mutilated dentitions in respect of extractions are found in 30 per cent of the 5-year-olds and in 78 per cent of the 8-year-old children during the mixed dentition period. These mutilated dentitions very often predispose to malposition of the erupting permanent dentition, and therefore a developing malocclusion. The malocclusions are shown to predominate in the 8- and 12-year-old groups, and are higher than shown in other recent examinations (Gardiner, 1956; Goose, Thomson, and Winter, 1957). Gingival health is better for the girls than the boys in all age-groups. The fair and poor fractions are shown to be highest in the 8-year-old group during the active mixed dentition stage, the eruption of the teeth often predisposing to food stagnation areas. The gingival health examination compared with malocclusions shows that good gingival health is associated with normal dentitions and that fair and poor gingival health conditions are associated with malocclusion, particularly Class II malocclusions. Much criticism has been suggested from time to time regarding "tuck shops" at schools. The present examination in respect of d.m.f. suggests that this has little effect on tooth decay—the children buying sweets elsewhere anyway. The views of the Head Teachers of the schools interviewed suggest that the "tuck shops" could be used to good effect from a dental health point of view with apples and fruit being provided for sale. The Vipeholm Dental Caries Study (1954) has shown that many foods eaten between meals can predispose to more rapid dental caries attack. Little improvement in the rapid caries activity can be envisaged unless food eaten between meals is curtailed. Fluoridation of public water-supplies and topical application of fluoride salts, etc., are several other means currently being investigated to help prevention of dental decay. Little connexion could be found regarding either residential area or intelligence levels in respect of dental health. In the 12-year-old group, the grammar schools had a slightly lower D.M.F. index, but this was not statistically significant. Hutchinson (1959) suggests this is significant in his recent Australian Survey. Further clinical examinations of this type in different areas, town and country, will greatly aid the development of a sound basic programme for providing adequate dental health for the child.

SUMMARY

For three age-groups of children, 5, 8, and 12, dental examinations were undertaken in respect of caries incidence, gingival health,

and occlusion. Higher rates of dental caries than recorded before are shown. The position of dental caries in the individual teeth is investigated. The gingival health examination of the children is shown in relationship to occlusion. Mutilated dentitions are defined and the high incidence for the three age-groups is shown. Place of residence and intelligence of the children are considered with regard to caries activity but no obvious connexion between them could be shown. Further investigations of this nature are suggested in order to establish sound preventive dental health measures for the developing child.

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Primordial Cysts

Twenty-two of these developmental abnormalities were studied. They are believed to arise from an enamel organ of the normal series, or from a supernumerary one, prior to the commencement of tooth formation. Very little has been written about them. The theory of their formation is that the stellate reticulum breaks down to form the cyst cavity; that the internal and external epithelia form the cyst lining, and that the fibrous wall is formed from the dental follicle.

Clinical Features.—The ages of the patients ranged from 14 to 67 years; most of the cysts were found in the second and third decades and there was no sex distinction. Regional occurrence: mandibular third molar, 9 cysts; mandibular premolar, 3 cysts; whole body of mandible, 2 cysts; maxillary third molar, 3 cysts; premolar, 3 cysts; canine, 1 cyst.

The cysts tend to be symptomless and may grow to a large size. X-rays reveal them to be small, round, radiolucent areas, and when the cysts are large they appear to be producing extensive bone destruction. In the mandibular molar region they may be mistaken for adamantinomata, and it is important to make a correct diagnosis in such cases because the treatment is different.

Histopathology.—The clinical and radiological features are not sufficiently specific for diagnostic purposes and sections must be studied. The histological features are:—

1. A regular, thin lining of stratified squamous epithelium with no rete pegs.

2. A layer of keratin on the surface epithelium and, maybe, keratin in the cavity.

3. Relative absence of inflammatory cell infiltration.

4. Presence of columnar basal cells with either pyknotic or vesicular nuclei.

All the cysts examined in the survey conformed in some ways with these criteria. The treatment is enucleation and they do not recur. The exact diagnosis of a primordial cyst is largely academic, unless an apparent multilocularity in a large cyst is mistaken for that of an adamantinoma.—SHEAR, M. (1960), *J. dent. Ass. S. Afr.*, **15**, 211.

G. E. B. MOORE

BITE GUARDS, BITE PLATES, AND ORTHODONTIC TREATMENT IN PERIODONTAL DISEASE*

By **ULF POSSELT**, Odont. Dr., L.D.S.
Malmö, Sweden

INTRODUCTION

APPLIANCES to treat bruxism or the effects of bruxism are generally called bite guards. Bite plates and occlusal plates can be used for correcting unfavourable condylar relationships and muscular spasm. These appliances, as well as orthodontic measures, are used for occlusal rehabilitation, i.e., the correction of functional disorders of the adult masticatory system (Posselt, 1959). This form of treatment is frequently a part, if only a small part, of some general periodontal therapy.

Fig. 1.—Acrylic bite guard on the lower arch articulating against the upper one.

It is important to establish a correct diagnosis since this is the basis for treatment. Occlusal analysis can be an aid in arriving at this diagnosis. It should be emphasized that functional disorders can be diagnosed only by means of a functional analysis.

BRUXISM

Bruxism is the clenching or grinding of the teeth independent of mastication and deglutition. Bruxism can cause occlusal trauma (microscopic tissue lesions in the depth of the periodontium) and may become an aggravating factor to an already existing periodontal disease. (Posselt and Emslie, 1959.)

Bruxism can be initiated by systemic, psychological, occupational, or occlusal factors. There is usually a combination of general and local factors influencing each other and setting up a vicious circle. "Any type of occlusal interference may, combined with nervous tension, initiate bruxism" (Ramfjord, 1960). Treatment, therefore, can be by general relaxation or by local treatment, for instance selective grinding or bite guards. Both types of therapy may break the vicious circle (Lipke and Posselt, 1960).

BITE GUARDS

The purposes of bite guards or bite plates in cases of bruxism are the following:—

1. To cure bruxism, if possible.
2. To protect single teeth and their periodontia against occlusal loads.
3. To protect the teeth against further abrasion.

Though it is most desirable to cure the bruxism, the protective action of bite guards against occlusal loads has been extensively stressed in the literature.

The following types of bite guard have been suggested:—

1. Hard acrylic bite guard in the lower (preferably) or in the upper jaw which establishes a balanced articulation with the teeth of the antagonizing jaw (*Fig.* 1) or an even contact on a flat bite-guard surface.
2. A resilient bite guard of soft acrylic or polyvinyl chloride, which has an even contact in centric occlusion. This appliance is mainly used against clenching.
3. A combined hard and soft acrylic bite guard with a hard acrylic core and a soft acrylic occlusal layer which articulates with the opposing teeth.

* Given at the meeting of the British Society of Periodontology held on April 6, 1960.

4. A Hawley or modified Hawley type of bite plate (Dessner, 1959) as used against bruxism (*Figs.* 2, 3A, 3B). Notice the acrylic covering the incisal edges and the absence of a labial wire retainer. This Hawley type of bite plate, used only at night, does not seem to result in intrusion of the lower front teeth or over-eruption of the molars.

An investigation is being carried out at the Department of Occlusal Analysis and Rehabilitation, in Malmö, which aims at establishing the indications for the use of the different types of bite guards. Although this investigation is not yet finished, it has been found that a considerable number of muscle and temporomandibular joint disorders can be successfully treated by means of bite guards.

In addition I would like to comment on what I believe is the curative mechanism of the different types of bite guards mentioned.

In these cases we have been helped by using bite guards of combined hard and soft acrylic.

b. The type of bite guard most extensively used is that which covers the occlusal surface

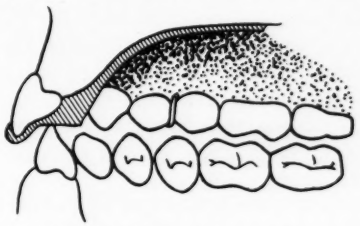
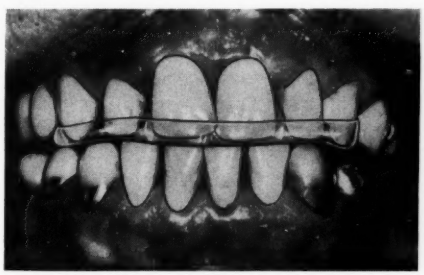
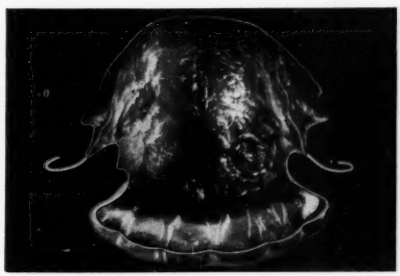


Fig. 2.—Modified Hawley plate used in cases of bruxism. Schematic drawing.

of only one jaw. If such a splint is made to occlude or to articulate properly it is clear that occlusal interferences will be eliminated. This is probably one of the main aims of bite guards.



A



B

Fig. 3.—A, Modified Hawley plate in situ; B, Modified Hawley plate. *Note* type of clasp.

It is clear that plates with complete occlusal coverage will protect single teeth from being overloaded. But which neuromuscular mechanism is altered by using these bite guards to allow a case of bruxism to occur?

a. One possible mechanism which could act against the local releasing mechanism of bruxism is that such splints give "an entirely new sensation".

This may be the main mechanism with the resilient bite guard which is mainly used in cases of clenching but not in gnashing. This type of bite guard has the drawback of being slightly larger on the buccal aspect, and sometimes patients will not tolerate these appliances.

By preventing cuspal interference, a vicious circle between the occlusion and the neuromuscular system can be broken. Although pressure on the molars will change using this type of bite guard, pressures are exerted on these teeth in contrast to the Hawley type of plate.

c. The main mechanism of the modified Hawley plate may be that the stimulation of the receptor organs in the periodontal membranes of the cheek teeth is prevented since these teeth do not make contact. There is evidence that this will produce less muscle contraction than with the types of bite guard mentioned under (*a*) and (*b*) (Lipke, 1960).

d. All bite guards tend to induce relaxation; since only a free-way space of $\frac{1}{2}$–1 mm. is left the mandible is made to take up a position at or near the rest position (Dessner, 1959).

BITE PLATES AND OCCLUSAL PLATES

These appliances are used with the following aims:—

1. Diagnosis: The use of a diagnostic plate or splint has been described elsewhere (Posselt, 1959).

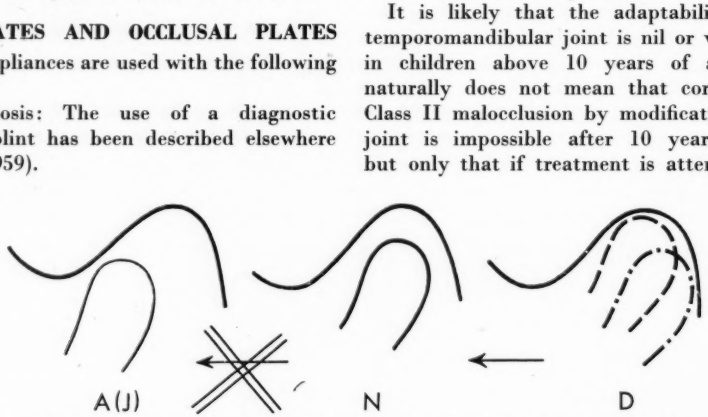


Fig. 4.—Middle (N): Normal condyle-to-fossa relationship in the intercuspal (occlusal) position, desirable after treatment; Right (D): Posterior condylar displacement –·–·–; Cranial condylar displacement ——; Left (A(J)): Anterior condylar displacement as the result of attempting to jump the bite anteriorly; also condyle position in atypical postural position of the mandible.

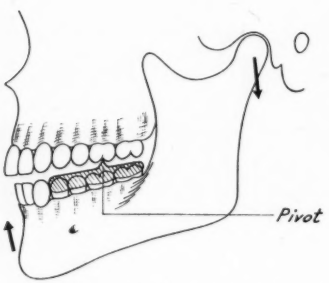


Fig. 5.—Schematic drawing of pivots (both sides). Cemented temporary silver splints which are later to be substituted by permanent prostheses (preferably bridgework) when the cranial displacement has been altered to a normal condylar position.

2. Correction of occlusal interferences: (*a*) Closing movements; (*b*) Gliding movements.

If occlusal interferences cannot be corrected by grinding, an occlusal plate can establish the optimal occlusal level for function.

3. Correction of condylar displacement (*Fig.* 4): (*a*) Horizontal; (*b*) Vertical.

(2) and (3) are important in connexion with prosthetic treatment in periodontal cases in which the periodontist has to judge whether prosthetic reconstruction is indicated or not.

3*a*. Evaluation of corrections in the horizontal direction is important.

It is likely that the adaptability of the temporomandibular joint is nil or very slight in children above 10 years of age. This naturally does not mean that correction of Class II malocclusion by modification of the joint is impossible after 10 years of age, but only that if treatment is attempted the tissue changes take place in the alveolar processes.

Fig. 6.—Cast temporary silver splints cemented on the premolars and molar of the lower arch to correct or relieve a posterior displacement. The splints were planned previously on the articulator and the corrected position of the mandible was checked by temporomandibular joint roentgenograms which indicated that the malrelation of the condyles in the fossæ had been corrected.

A correction, or relief, of a posterior displacement of the condyle, however, can be made. Correction can be made from the relation D to the relation N as shown in *Fig.* 4. But the position A (J) should not be established as the occlusal position.

A Class II malocclusion (Angle) has nothing to do with the condyle-to-fossa relationship,

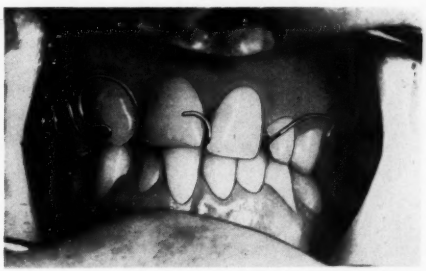
which is generally quite normal in the intercuspal (occlusal) position.

3*b*. Correction, or relief, of condylar positions in the vertical direction can be made by the following means amongst others: (i) Thick resilient splints (Campbell, 1957); (ii) Pivots (Sears, 1956) (*Fig.* 5).

All these plates mentioned under (2) and (3) are interim appliances, so that if the patient is not willing to have more permanent prosthetic reconstruction carried out they should not be used. The same is true if the patient is not co-operative. Owing to the caries risk

Fig. 7.—The case shown in *Fig.* 5 with the permanent prosthetic reconstruction in situ.

A



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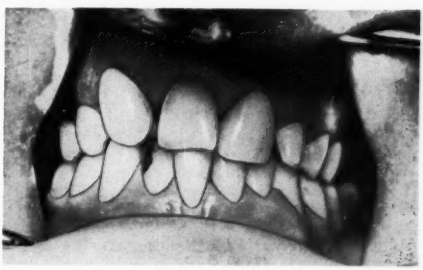

C

Fig. 8.—Tooth crowding in a 32-year-old man, especially malpositioned right central incisors upper and lower. A, Before treatment. B, Treatment surgically by the extraction of the upper right lateral incisor and orthodontically with a removable plate with springs, to produce mesial shift of upper right cuspid and rotation of upper right incisor. C, Post-orthodontic treatment results.

under removable splints, cemented splints are preferable if these have to be worn permanently. *Fig.* 6 shows silver splints in position, and *Fig.* 7 the corresponding permanent bridgework (correction from the relation of D to the relation of N, *Fig.* 4).

PERIODONTAL SPLINTS

A periodontal splint aims to support loosened teeth and to splint them to teeth that are still firm in the alveolus. It is obvious that the other portions of the periodontal treatment must be carried out, but if the periodontal disease is sufficiently advanced there is a distinct indication for periodontal splinting.

There are various types of simple removable splint, wire splint, removable plates, or continuous clasp splints, cast in gold or steel. Fixed splints are generally more complicated to construct than removable ones.

ORTHODONTIC APPLIANCES USED IN ADULT PERIODONTAL CASES

Functionally, malocclusion could cause damage to the periodontium in various ways, for example: (1) Direct soft-tissue damage, as in the case of over-erupted teeth; (2) Irritation of the gingiva due to accumulation of food debris around crowded or malalined teeth; (3) Hidden tissue damage due to

abnormal or subnormal occlusal stresses during functional movements and/or bruxism. Hypofunction will influence both the functional and the hygienic state of the periodontal tissues.

Orthodontic treatment can be carried out without perceptible tissue damage in cases of periodontal disease even in elderly persons, provided that only moderate tooth movements are attempted, and that adequate retention is available. This can be done by using simple,

A B

Fig. 9.—Thirty-five-year-old man. Orthodontic correction of inferior protrusion and eventual permanent prosthetic reconstruction. A, *Left*: Before orthodontic treatment; *Right*: After orthodontic treatment (Oppenheim plate). B, Prosthetic reconstruction completed.

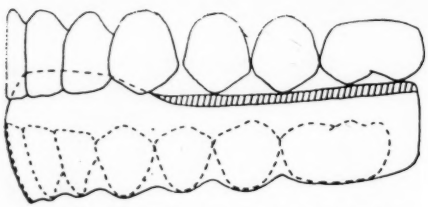

Fig. 10.—Schematic drawing of Oppenheim plate. The hatched part of the plate which is in contact with the occlusal surfaces of the side teeth is reduced little by little. The inclined plane in the front tooth region will then start tipping the upper incisors labially. (*By courtesy of Dr. Anders Lundström, Editor, "Nordisk Lärobok i Odontologisk Ortopedi, Stockholm"*, 1958, *p.* 239, *Fig.* 207.)

removable appliances (Posselt and Nohrström, 1960). The indications for orthodontic treatment in periodontal disease under these circumstances are the following:—

1. Crossbite cases, especially in the incisor region.
2. Tooth migration (possibly secondary) with diastema, especially in the upper incisor region.
3. Crowded teeth.
4. As a preparation for or alternative to prosthetic reconstruction.

Treatments under (4) necessitate rather large and complicated tooth movements, and will therefore not be dealt with here. In rare cases orthodontic treatment may be necessary in order to aline the teeth in such a way that splinting may be more satisfactory.

The purpose of the treatment is to improve function and periodontal health rather than to obtain morphological normality. Functional normality, naturally, should also include the best possible hygienic and æsthetic positioning.

It should be emphasized that adult orthodontic treatment is necessary in only a very small percentage of cases treated (2 per cent as compared to 80–90 per cent occlusal adjustment by grinding).

Periodontal tooth migration may cure itself after periodontal surgery alone. In these cases no orthodontic treatment is necessary.

In cases which require extensive prosthetic treatment orthodontic measures may become superfluous.

Cross-bite and Crowding.—Two examples, one of each case, will illustrate these aspects (*Figs.* 8, 9).

The most important functional indication for orthodontic treatment is in cross-bite occlusions. Cross-bite either in the anterior or posterior regions of one or more teeth is fairly common. Among 400 patients referred to the Department of Occlusal Analysis and

between
70% & 80%
of all
United Kingdom
dental practices
regularly use

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TRADE MARK BRAND

Lignocaine local anaesthetic

between
70 & 80
overseas countries
import it regularly

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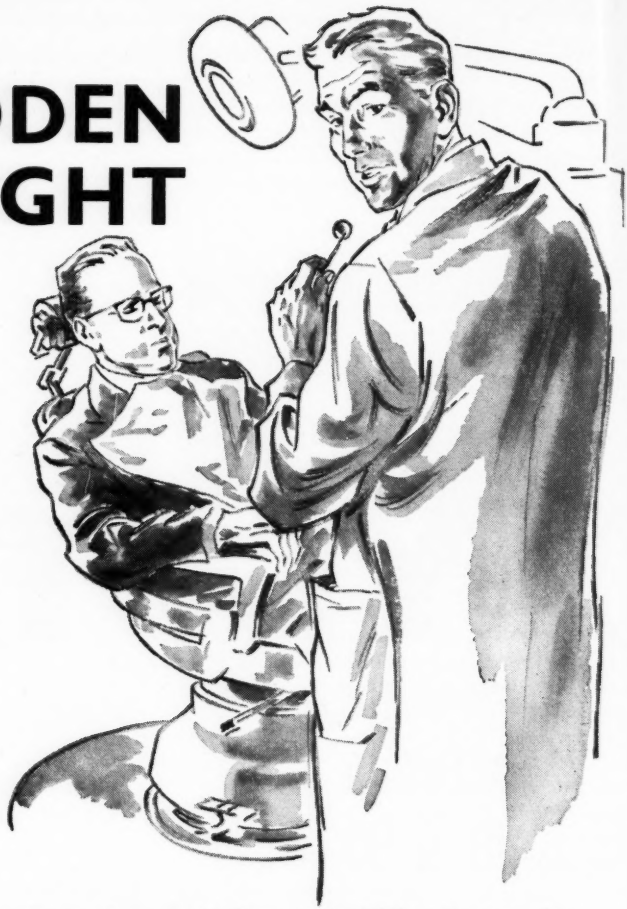
A SUDDEN THOUGHT



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Rehabilitation, The Royal Dental School, Malmö, about 35 per cent had cross-bites.

The question whether the functional disorder should be treated orthodontically, or by grinding alone, or possibly by a combination of grinding and prosthetic treatment, can generally be made only after analysing the articulation of models mounted on an adjustable articulator.

Some tooth movements can be obtained by grinding alone.

A simple appliance which has been shown to be useful is the Oppenheim plate (*Fig.* 10). The advantage of this appliance is that movements can be initiated with very small forces and at definite intervals.

There are, naturally, many cases where active plates with springs can be used.

Often the orthodontic and prosthetic treatments can be combined.

SUMMARY AND CONCLUSION

1. The present article presents some classifications of simple appliances for occlusal rehabilitation.

2. Some indications for the use of bite guards and bite plates are enumerated.

3. The dysfunctional aspects in contrast to the morphological aspects of occlusal disturbances are touched upon.

4. The importance of a functional analysis as a basis for diagnosis and treatment planning is stressed.

5. The use of bite guards is important from a social standpoint because they are simple and can be made cheaply.

6. The curative mechanism of bite guards is discussed.

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Subacute Bacterial Endocarditis—A Clinical Study

The records of fifty patients treated for subacute bacterial endocarditis between 1950 and 1956 at University Hospital, Ann Arbor, Michigan, were reviewed and a number of important observations made.

Once more the importance of rheumatic and congenital heart disease emerged as the cause of the predisposing valvular lesion. All save one patient had demonstrable physical signs of a heart lesion and in the case of the exception a history of rheumatic fever was obtainable. Where dental treatment had initiated the disease, in no case had antibiotics been given prophylactically. Of the initiating factors, extractions accounted for 22 per cent of cases, scalings 2 per cent, root canal manipulations 2 per cent, upper respiratory infections 32 per cent, and unknown causes 24 per cent. Medical conditions and manipulations accounted for the remaining 18 per cent.

Bacteriological studies indicated that *Streptococcus viridans* was still the commonest organism in those cases produced by dental treatment, and although penicillin resistant organisms were found, there appeared to be no increase in their numbers over the years.

Although the condition of the mouth on admission was not recorded in 12 instances, in nearly half of the patients the oral health was only poor or fair.

In spite of modern antibiotic therapy the mortality for 50 patients was 20 per cent.

The use of prophylactic antibiotics during the treatment of patients with lesions of the heart valves is once more emphasized. In addition, the possibility that oral disease could have contributed to the 24 per cent for whom no obvious initiating cause could be found was speculated upon. Both doctors and dentists should urge all patients with valvular lesions to have routine dental care, thus eliminating the bacterial showers which even chewing can produce where oral sepsis is present.—MILLARD, H. D., and TUPPER, C. J. (1960), *J. oral Surg.*, **18**, 225.

G. R. SEWARD

AUDIO-ANALGESIA*

By **A. E. F. STURRIDGE**, L.D.S. R.C.S., D.D.S.

THE provision of music as a means of diverting the attention of patients, particularly children, during routine dental procedures needs no introduction. In order to sustain the interest of a listener, however, it is necessary to provide music of a type that gives him pleasure, and of a quality that will retain his interest without effort. If one fulfils these requirements it is possible for a patient to become so absorbed that he may be quite reluctant to leave at the end of an appointment.

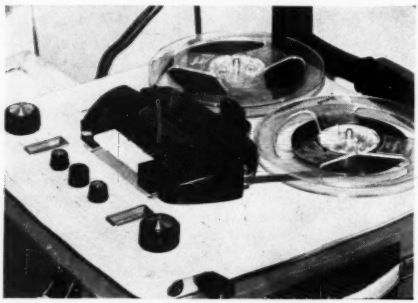

Fig. 1.—The Brenell tape recorder in the surgery.

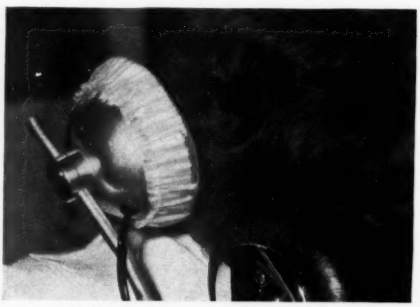

Fig. 2.—The speaker in the listening position.

A tape recorder is the simplest method of providing the music. It is possible to pre-select a tape which would most interest a particular patient, and once set in motion, up to two hours' continuous music can be provided of first-class quality. Any one of the medium-priced recorders on the market at present is suitable, provided it will carry a 7-in. spool of tape, and play back through an external speaker at a speed of $7\frac{1}{2}$ in. per sec. (*Fig.* 1).

An extension wire from the recorder is coupled to a $2\frac{3}{4}$-in. diameter moving coil speaker, housed in an adjustable aluminium cover. This is attached to the head rest in such a way that it can be placed in close proximity to the patient's left ear (*Fig.* 2). In this position it acts as a convenient arm rest for the operator. When not in use it folds back behind the chair and out of the way (*Fig.* 3).

The speaker is covered with a layer of cotton-wool, and enclosed in a plastic cover of the type used for jam bottling, in order to give it a comfortable "feel" to the patient. It is necessary to have an additional volume control for the patient to adjust in order to compensate for the noise of the drill or the sucker. This is a simple resistance which is looped into the speaker wire and attached to the side of the arm rest. If it is handed loose to the patient it tends to fall on to the floor the first time he picks up a glass to rinse out.

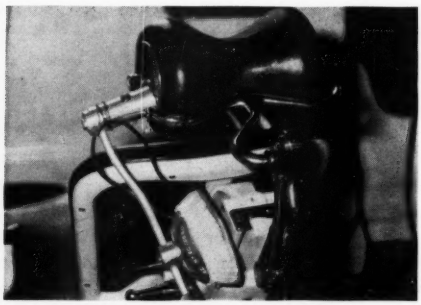

Fig. 3.—The speaker folded back.

In use it is possible for the operator to hear what the patient is listening to without the noise being in any way obtrusive. At the same time the patient can hear the dentist with the uncovered ear, and will respond to

* Based on a table clinic presented at the American Dental Society of Europe in Edinburgh, July 7, 1960.

instructions in the normal way. As the range of sound which can be transmitted by a speaker is directly proportional to its diameter, the quality is better than that obtained with earphones, and there is the advantage that nothing has to be "put on" which tends to dissuade the timid or self-conscious.

A library of four tapes has been found to cope with most tastes. Children under 8 enjoy the kindergarten stories set to music, such as the train songs by Ruth Fenner. After that they are divided into three categories, Pops, Light Music, and Classical. Much pleasure can be had in making up different tapes from the radio or gramophone, and trying out patient's reactions! Pre-recorded tapes are available for those who do not wish to bother with this.

Acknowledgements.—I am indebted to Mr. J. C. Aldred, of Universal Electronic Products, who made the speaker, and to Mr. G. H. Leatherman, who provided the stimulus.

REFERENCE

GARDNER, W. J., and LICKLIDER, J. C. R. (1959), *J. Amer. dent. Ass.*, **59**, 1144.

BOOK REVIEWS

INTERNAL MEDICINE IN DENTAL PRACTICE. By LEON H. COLLINS, Jr., A.B., M.D., F.A.C.P., F.C.C.P., Associate in Medicine, School of Medicine, and Assistant Professor of Medicine, School of Dentistry, University of Pennsylvania, etc.; and MARTIN P. CRANE, B.S., M.D., Sc.D. (Hon.), Chief Physician, The Misericordia Hospital, Philadelphia, Reserve Consultant in Medicine to the U.S. Naval Hospital, Philadelphia, etc. Fifth edition. $9\frac{1}{4} \times 6$ in. Pp. 555, with 94 illustrations and 6 coloured plates. 1960. London: Henry Kimpton. 63s.

THIS, the fifth edition, appears under the editorship of two authors engaged in medical practice in the U.S.A.

Admitted that medical data as to certain diseases must necessarily be vital in the treatment of the dental patient, the authors appear to have been carried away by detailed references to certain diseases, many of which have little or no relation whatsoever to the dental formula. On the other hand, certain other ailments encountered in dental practice receive very scant attention. A shortening of the text by the excision of less relevant material and the inclusion of descriptions of oral conditions and their relationship to systemic diseases would make the work more helpful to the professional reader.

This initial criticism apart, there are adequate summaries, in helpful "box" form, to which ready reference can be made, although one such "box" (on p. 56) would be improved by an adjustment of lines.

The book is divided into fourteen sections, broadly classified under the systems that go to the making of the human body, and dealing with complementary subjects such as infections, arthritis and allied conditions, allergy, deficiency diseases, intoxications, chemotherapy, etc.; in all, a comprehensive work of reference.

The letterpress is enhanced by the inclusion of 94 photographs and 6 coloured plates, although the quality of several—notably those dealing with intra-oral conditions—could be improved upon in subsequent editions.

The reviewer commends the authors' insistence on the importance of reviewing the medical history of the patient at regular intervals in order that certain changes might be taken into account in deciding upon the extent and manner of the dental treatment appropriate to the case, a precaution as essential to patient as to practitioner.

In some respects there appears to be a lack of clarity on such points as: What are the dental implications of the employment of steroids and anticoagulants in dentistry? What is implied in non-absorbable antibiotics? Classification of tongue conditions might also be dealt with more clearly and comprehensively.

However, in a volume of this character, occasional flaws are unavoidable, though it should be stressed that these defects do not

seriously detract from the value of the book. Generally speaking, this work of reference can be recommended to all dentists whether in private or hospital practice. Authors and publishers are to be congratulated upon a generally excellent publication. H. M.

ORAL ANATOMY. By HARRY SICHER, M.D., D.Sc., Professor of Anatomy and Histology, Loyola University School of Dentistry, Chicago College of Dental Surgery, etc. Third edition. $9\frac{3}{4} \times 6\frac{5}{8}$ in. Pp. 514, with 314 illustrations, including 25 in colour. 1960. St. Louis: The C. V. Mosby Co. (London: Henry Kimpton). 101s. 6d.

IN the chapters on systematic anatomy in this book one finds the erudite exposition that is to be expected from an anatomist of Professor Sicher's standing. The chapter on the temporomandibular joint has been brought up to date and largely re-written and can be strongly recommended, but the section on tooth eruption, while it deals quite well with this difficult topic, does not clearly differentiate between fact and supposition and fails to admit how much we have yet to learn about this interesting subject. In the chapter on peripheral nerves an attempt is made to discuss the somatic visceral and special visceral components of the cranial nerves, without detailed reference to their nuclei in the brain-stem, and consequently clarity is not achieved.

Three editions of Sicher's *Oral Anatomy* have been required in eleven years. The original intention was that it should supplement the information to be found on the head and neck in medical anatomical texts, and in addition supply the clinical dental student with information on applied anatomy. Without doubt it has done a great deal more than this. It has contributed to the broadening of the scientific background of dentistry and has fulfilled the anatomical needs of the postgraduate student in this respect. During this time the scope of the various dental specialities has increased rapidly, and the reviewer finds himself now somewhat critical of the chapters on applied anatomy.

Space could surely be saved by integrating the important points from the chapters on "The Palpability of the Facial Skeleton", "The Structure and Relations of the Alveolar Process", and "The Temporomandibular Articulation" of Part II in the appropriate chapters in Part I, as has been done with the orthodontic topics. The discussion on the anatomy of local anæsthesia would also gain in impact if it immediately followed the chapter on the nerve-supply of the head and neck.

Chapter II deals in effect with topographical and surgical anatomy, and it seems a pity that operations for the formal ligation of arteries are given prominence in it. While no one would doubt their importance, these procedures are infrequently carried out. This chapter might well be expanded to include some of the more common major surgical procedures undertaken by the oral surgeon.

As with most anatomical work, the surgical anatomical descriptions suggest the cadaver class rather than anatomy as it is seen through the operation incision.

The chapter on the propagation of dental infections should be read by all students, both undergraduate and postgraduate, although it could do with additional illustrations.

The general standard of production of the book is high and the illustrations are good with the exception of Figs. 103, 104, 224, and 229. G. S.

INTER- AND INTRA-FAMILY VARIATIONS IN THE FACIAL PROFILE. (An X-ray cephalometric investigation on young adult male sibs.) By KARL V. SARNÄS. *Odont. Rev.*, 1959, **10**, Suppl. 4, 116.

THIS publication shows the results of an investigation by the author on a series of sibs, each of which has been subjected to a cephalometric analysis involving the head in profile, including the soft tissue, with the mandible in the habitual rest and occlusal positions. The object was to make an interpretation of the causal developmental relationship of associated dimensions, and to study the variation in the facial morphology. A new biometric technique has been used which the author calls the "family method". This is a combination of

variance analysis and the calculation of residuals.

To be able to appreciate fully the significance of all the results, knowledge of statistics is required. However, the conclusions reached are clearly presented and are sometimes surprising, especially in the relationship between lip morphology and depth of overbite.

J. S. R.

COMPLETE DENTURES. By MERRILL G. SWENSON, D.D.S., F.I.C.D., F.A.C.D., Professor of Dentistry and Head of Department of Denture Prosthesis, University of Oregon Dental School, Portland, Oregon; and in collaboration with CHARLES J. STOUT, B.A., B.S., D.M.D., Associate Professor of Dentistry, Denture Department, University of Oregon Dental School, Portland, Oregon. Fourth edition. $9\frac{3}{4} \times 6\frac{3}{4}$ in. Pp. 682, with 856 illustrations (including 10 in colour). 1959. St. Louis: The C. V. Mosby Co. (London: Henry Kimpton). 101s. 6d.

To have reached a fourth edition of *Complete Dentures* with intervals of approximately six years between each is an achievement of which Professor Swenson must be justly proud. That there is a need for each edition reflects the progressive understanding of the morphology of the oral tissues, the advances in technique, and the changes in the materials used.

The increase in the average life-span, causing a rise in the proportion of old people, naturally creates a growing demand for complete dentures, and Professor Swenson considers that the prosthodontist has a real opportunity to study the science of geriatrics and geriatric nutrition. He places considerable stress on this problem of the ageing tissue in his opening chapter, and makes some interesting observations regarding diet in such cases.

The book is divided into five parts, the first of which deals with the fundamentals and principles of complete dentures. In length it is just over half the total, and it is a very full study of the factors which must be known and understood if all the varying types of edentulous cases are to be treated successfully.

The chapter on "Anatomy and Physiology" in relation to denture construction, which in its many illustrations includes the ten in colour, could be studied by specialist and student alike with great benefit.

The scope of the work is wide, with a wealth of detail and full explanation of every step involved. The amount of reading matter, however, is controlled and reduced by the great number and the large size of the photographic illustrations and diagrams, which are clearly produced and well placed in relation to the text.

The section on immediate dentures is comprehensive and instructive, but perhaps the chapter on "Perfection of Occlusion" is too elaborate and time-consuming for something which could be achieved directly in the mouth.

Repairs, duplicating, and rebasing of dentures are adequately covered, as is also the cast metal base for an upper case. Alternative methods, apparatus, and materials are included throughout the work without any tendency to confusion, and repetition is cleverly avoided. In such a comprehensive volume it is a little surprising that whilst the full upper denture is considered in relation to natural mandibular teeth and to a partial lower denture, the arrangement of a full lower denture in relation to similar conditions in the upper jaw is not even mentioned.

Altogether this is a most impressive volume which meets the needs of the denture specialist and the general practitioner. The advanced dental technician would also gain much knowledge from the great experience in practical work which is in evidence throughout the text and the illustrations.

Professor Swenson, his collaborator Dr. Charles J. Stout, and the publishers, the C. V. Mosby Company, are to be congratulated on their efforts.

R. V. P. C.

ERRATA

Vol. XI, No. 1, p. 10, abstract "Effects of Antihistaminic Agents on Inflammatory Responses after Surgical Trauma". Col. 1, bottom line, *for* freezing *read* opening. Col. 2, line 7, *for* The *read* No

Vol. XI, No. 2, p. 70, caption *Fig.* 17, line 6, *for* isolated *read* rotated.

ABSTRACTS FROM OTHER JOURNALS

Penetration of Tissue by Grease under High Pressure

Since 1937 a number of cases have been reported describing the events following the accidental injection under high pressure of fuel oil or engine grease into the tissues. These accidents have involved fingers and hands most commonly. Initially, there is little complaint about the wound, but 8–24 hours later pain becomes severe, though there is as yet nothing remarkable to see. Great swelling, suppuration, and necrosis follow. Where tissues are confined by dense fascia as in the fingers, gangrene necessitating amputation occurs. Healing of the wound is greatly protracted. Clinical and experimental studies indicate that the oil or grease incites the formation of a sterile abscess. A case in which the face was injured is reported.

A 30-year-old man was struck on the left side of the face by a bolt together with a stream of tractor lubricating grease which emerged from a pin-sized hole under several thousand pounds pressure. These missiles caused a superficial laceration of the left cheek and a penetrating wound 1·5 cm. long at the left ala of the nose. On admission there was a temperature of 101° F., but no local reaction to the wound. He was given analgesics and a tetanus toxoid booster. A course of penicillin and streptomycin was commenced and a dextrose infusion started. The wound was explored surgically and 30 c.c. of grease removed. The nostril was packed, but only two sutures inserted. On the second post-operative day his general condition was serious and massive local swelling involving the neck necessitated a tracheostomy under local anæsthesia. Resolution was slow, although the tracheostomy tube could be removed one week later. Three weeks after the injury there was still local swelling and the wound was still discharging grease. It was some $2\frac{1}{2}$ months before the wound finally healed. The nodular scar is being watched as these oils are known carcinogens.

The case is discussed and important principles of treatment, including early tracheostomy, are laid down.—SHAPIRO, D. N., and HINDS, E. C. (1960), *J. oral Surg.*, **18**, 243.

G. R. SEWARD

[Editorial comment: This paper should be read by all who come into contact with modern industrial accidents.]

The Surgical Cement Inlay as a Temporary Filling

The placement of temporary fillings has an important part in daily practice and the ideal one has yet to be perfected. The two common ones, gutta percha and the mixture zinc oxide–eugenol, have disadvantages; the former may damage the pulp, is easily dislodged, and offers little resistance to wear, and the latter usually requires drilling for removal, with the possibility of cavity-margin damage. An ideal temporary filling material should be easy to insert and remove, re-usable, and it should not cause pain or pulpal damage. Some success has been obtained with Ward's pink, quick-setting surgical cement.

Technique.—

1. A mass of medium heavy consistency is incorporated with cotton-wool fibres.
2. The mass is pressed gently into place in the cavity with a cotton-wool pellet moistened with olive oil.
3. The jaws are closed until the mass has set.
4. The "surgical cement inlay" is removed with a sickle probe.
5. The inlay is trimmed with shears.
6. A thin mix of the cement is made, coated on the fitting surface of the inlay, and when the inlay is replaced in the cavity the jaws are again closed.
7. The excess cement when it has set is removed with disks and the occlusion checked.
8. At the next visit the inlay is carefully removed with a sharp instrument and it can usually be used again.—BERMAN, M. H. (1960), *J. dent. Ass. S. Afr.*, **15**, 194.

G. E. B. MOORE

COMMON FAULTS WITH REMOVABLE APPLIANCES

By **A. G. HUDDART**, F.D.S., D.Orth. R.C.S.
Consultant Orthodontist, Birmingham Regional Hospital Board
and **M. F. SCOTT**, L.D.S. R.C.S.
S.H.D.O. (Orthodontics), Birmingham Regional Hospital Board

THE importance of making orthodontic applicances wearable is all too frequently forgotten.

A removable appliance of basically good design is often unsatisfactory because some small point has been overlooked during its construction, and it is not to be assumed that a patient is unco-operative simply because the plate is not worn. Painstaking attention to small details is essential if an orthodontist is to make his appliances wearable.

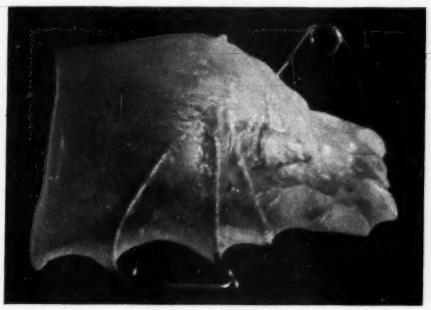

Fig. 1.—Pimple on fitting surface of plate.

Fig. 1 shows an appliance with a large pimple on the fitting surface. This plate has been shown to many orthodontists and their criticism invited, but so far nobody has noticed the fault, although it makes the plate completely unwearable.

Three main factors contribute to the wearability of an appliance: (1) Simplicity; (2) Comfort; (3) Discreetness.

1. Simplicity.—Appliances should be as simple as possible, preferably with no more than two springs, otherwise the anchorage may be insufficient. In addition the patient may find himself unable to cope with the complex procedure of insertion and will either insert it incorrectly or not at all.

Fig. 2 shows an appliance which was in the pocket of a patient referred with a history of non co-operation. Apart from having five springs of various kinds, there were several sharp edges on the plate, retention and anchorage were poor, and the multiple buccal retractors were traumatizing the mucosa. The appliance was obviously too complicated for the patient to handle and was most uncomfortable to wear. It would have perhaps been more surprising if the patient *had* worn it.

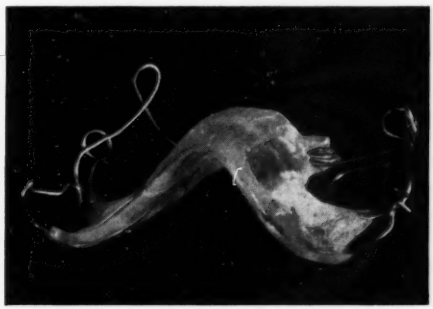

Fig. 2.—Unwearable appliance, badly designed and poorly finished.

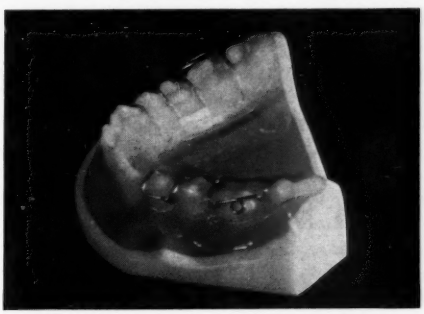

Fig. 3.—Lower removable appliance for intermaxillary reinforcement of the anchorage. Note absence of lower labial bow.

A demonstration given at the meeting held on May 9, 1960.

Another example of an awkward appliance to handle is the plate with a "Z" spring to move upper incisors labially. This can be most difficult for the younger patient below the age of 8 years to insert correctly, and usually an appliance with a Glenross or similar screw is preferable because of its simplicity. The greater bulk of the plate due to the screw is surprisingly well tolerated by these younger children, and usually no trouble is encountered because of it.

2. Comfort.—This may be subdivided into: (*a*) Security; (*b*) Painlessness.

a. Security.—This implies good retention for the appliance with well-made Adams cribs which are free of the bite and do not traumatize the gingivæ. The plate has also to be free of any tendency to spring out of the mouth and in certain cases (e.g., pusher spring to move upper incisors labially) great attention must be paid to clasping, often by utilizing premolar as well as molar teeth. Some authorities advocate the use of an inclined bite plane on an upper appliance to give intermaxillary reinforcement to the anchorage when upper teeth are being retracted. This, however, results in a forward displacement of the lower jaw on closure which some patients find unpleasant. To reduce an overbite, a small flat bite platform is preferable and if further anchorage is required a removable lower plate for intermaxillary traction should be used (*Fig.* 3). Excessive posterior gagging when upper incisors are being moved over the bite is also uncomfortable especially for the older patient, and a 1-mm. open bite anteriorly when the plate is in position is quite sufficient.

b. Painlessness.—It is extremely easy to make an appliance painful. Some of the commonest causes are:—

i. A rough, poorly-finished fitting surface with sharp gingival margins and pimples.

ii. Buccal retractors which traumatize the mucosa. These springs are very vulnerable and often become distorted during use. In addition, if made in 0·7 mm. wire they need frequent adjustment. Although a more flexible buccal spring can be made from 0·5 mm. wire reinforced by 20 gauge (0·5 mm. internal diameter) tubing, the more trouble-free way of retracting canines and premolars is the 0·5 mm. palatal spring, which is covered and protected by acrylic to a great extent. The use of buccal retractors should be restricted where possible, therefore, to teeth which have to be moved distopalatally as opposed to directly distally.

iii. Sharp ends of springs and tubes can also lacerate the mucosa. Although the initial fitting may have been satisfactory, distortion during use may allow the sharp end of a wire to traumatize the mucosa. Some distortion of wires must always be expected with removable appliances, but intelligent anticipation should prevent the plate becoming painful as a result.

iv. High labial arches and apron springs, like buccal retractors, are a potential source of trouble due to distortion in use and should be avoided where possible. The Roberts retractor has been found to be more satisfactory when retracting incisors (*Fig.* 4). In addition it can also be used as a form of intermaxillary hook if desired, without any modification, should a lower traction plate be indicated to reinforce the upper anchorage.

v. Excessive spring pressure on a tooth must be avoided. A palatal finger spring in 0·5 mm. wire only needs about 2–2·5 mm. of activation for tooth movement to proceed smoothly, and it should take about 6 months to retract a canine or a premolar a full unit. If tooth movement is done more quickly than this, there is a danger that excessive tipping may occur. Usually such springs only need adjustment every 2 months. A tooth may be slightly tender up to 24 hours after adjustment, but apart from this it should remain firm and symptomless during movement.

3. Discreetness.—This is an often neglected aspect of appliance design, but it should be remembered that even children are human! Older patients, especially adolescent girls in their 'teens, are very sensitive about their appearance and are grateful for an inconspicuous appliance. Being less obvious, palatal finger springs should therefore again be used in preference to buccal retractors to move canines and premolars distally. Also, whilst some cases justify a stabilizing labial arch, there are many, particularly of the routine

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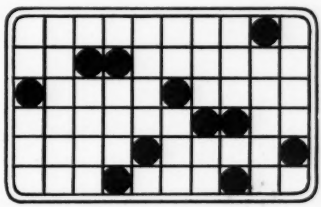

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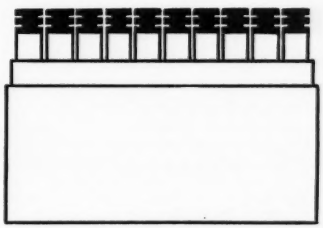

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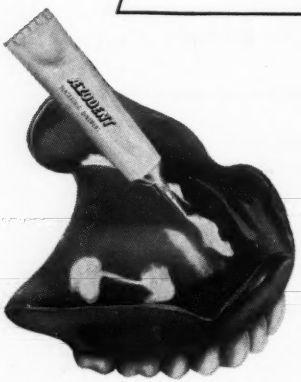

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Angle Class II, division 1 type, where it can be omitted.

Fig. 5 shows a plate to reduce the overbite and retract the upper canines which would hardly be suitable for the older patient. It has an inclined bite plane with buccal springs to retract $\underline{3|3}$ and a stabilizing labial arch.

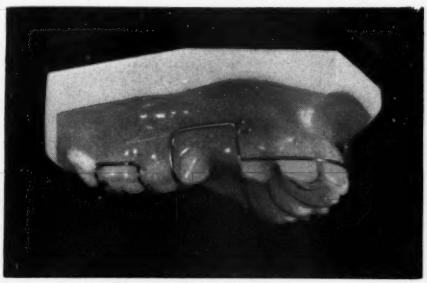

Fig. 4.—Roberts retractor.

Fig. 6 is an alternative design, just as efficient in the average case but far less conspicuous and more pleasant to wear. This had a low flat bite platform, palatal springs, and no labial arch.

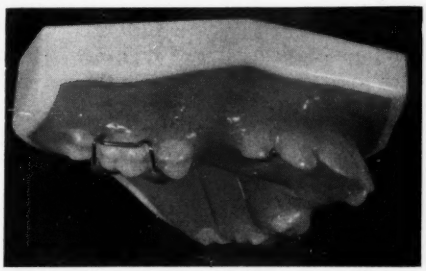

Fig. 6.—Alternative design. More comfortable and less obtrusive than *Fig.* 5.

The most inconspicuous way of retracting upper incisors is to use Paul's tubing, which is practically invisible when moistened with saliva. Care must be taken to prevent the elastic riding up the labial surfaces of the incisors and traumatizing the labial gingivæ, however, but in most cases it is possible to adjust the appliance satisfactorily in order to stop this. Paul's tubing is not quite so precise in its action as the Roberts arch, but where appearance is an important consideration it is a very satisfactory alternative.

When retracting upper incisors make sure that the plate is cut away completely behind the anterior teeth to prevent trapping of the mucosa in this region (*Fig.* 7). If this is not done, tooth movement may be prevented and the hypertrophy of mucosa which also results can be extremely painful.

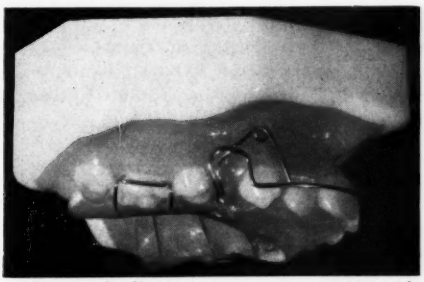

Fig. 5.—Appliance to retract upper canines with buccal retractors, labial bow, and inclined bite plane.

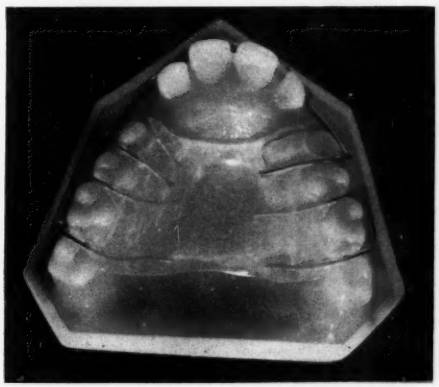

Fig. 7.—Plate cut well away palatally to allow retraction of $\underline{21|12}$.

Patients, however large or small, need a simple, comfortable, discreet appliance to wear, and by attention to detail it is possible in most cases to provide it. Given such an appliance and a patient who genuinely desires orthodontic treatment, there should be little trouble in seeing it is worn sufficiently to be effective.

At the demonstration meeting examples of appliances both correctly and incorrectly made were shown and some of them have been illustrated here.

SIMPLE FIXED–REMOVABLE APPLIANCES FOR CANINE AND PREMOLAR ALINEMENT

By **J. C. STEPHENSON**, B.D.S., F.D.S., D.Orth. R.C.S.

REMOVABLE appliances, when used for the alinement of canines and premolars, cannot prevent the occasional appearance of rotations or tilting of the teeth concerned. In these cases the use of a full fixed appliance is the method of choice, but in addition to being a time-consuming procedure, this is often not possible for social and other reasons.

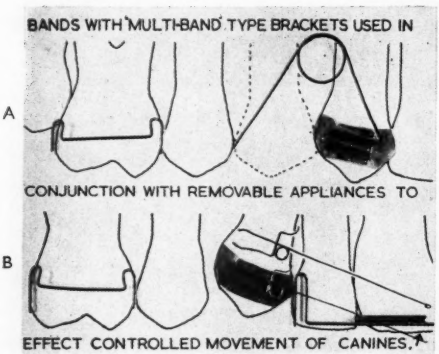

Fig. 1.—A, Adams's type (0·7 mm.) buccal canine retractor with end of spring thinned and bent to form a "spike", engaging one of the ligature tubes of the "multi-band" bracket, usually the more gingival one, to produce rotational or other movements in addition to retracting the tooth. B, Detachable "whip" in 0·45 mm. or 0·018 in. stainless steel wire with short piece of similar wire welded and soldered at right angles to it, and adapted to engage the two ligature tubes of a "multi-band" bracket on the canine. The patient activates the "whip" by "clicking" the the end of the arm into a piece of slit 0·9 mm. internal diameter tubing, attached to the labial arch.

The use of bands with standard multi-band type brackets in conjunction with removable appliances enables these tooth movements to be controlled, whilst a minimum of chairside time is involved in their construction and adaptation to individual teeth.

The first appliance (*Fig.* 1 A) was designed to prevent an upper canine rotation becoming worse during retraction of the tooth, but it was found possible to do not only this but also correct the rotation in the process. The buccal retractor spring was constructed in 0·7 mm. stainless steel wire and was of the type described by Adams (1957), but modified so that the end of the spring, instead of engaging on the mesial aspect of the tooth, was thinned and bent to form a spike which the patient placed within one of the ligature tubes of the bracket (usually the more gingival one). By adjusting the position and direction of the "spike" the spring could be activated to produce rotational and other movements in addition to retracting the tooth.

The second appliance (*Fig.* 1 B) was designed in the first instance to produce rotational and "eruptive" movements for final alinement of an upper canine that had been moved into the line of the arch from a displaced palatal position. As in so many of these cases the patient was older than the average, and after several months of appliance therapy which had moved the canine into the arch, the construction of a full fixed appliance to merely rotate and produce final "eruption" of the tooth would have been a very involved and time-consuming procedure.

The canine was accordingly banded and a "whip" constructed in 0·45 mm. stainless steel wire to be fitted into the bracket tubes. The construction of this "whip" involved the careful welding at right angles to the "whip" arm of a short piece of similar wire, and in order to give this union maximum strength the upper short arm was heated and hard solder allowed to flow down on to the union, care being taken to preserve the temper of the other three arms. Two of these arms were then adapted with a pair of fine spring-forming pliers so that they made a tight push-fit in the ligature tubes of the bracket. A loop was incorporated in the "whip" arm to increase its flexibility and also to vary the direction of

A demonstration given at the meeting held on May 9, 1960.

movement. The existing removable appliance was modified by soldering a short length of 0·9 mm. internal diameter tubing to the arch and slitting it anteriorly with a carborundum disk. Thus, when the "whip" was attached to the canine band, it could be activated to produce rotational and eruptive movements by "clicking" the arm into position inside the slit tubing.

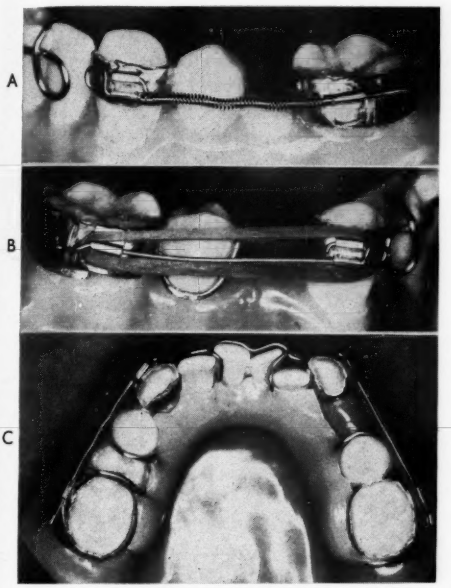

Fig. 2.—A, Sectional arch in 0·016 in. or 0·018 in. stainless steel or Elgiloy type alloy wire, one end forming a loop with two arms passing through the ligature tubes of a "multi-band" bracket on the canine, the longer arm also engaging the buccal sheath on the molar. A 0·7 × 0·15 mm. open stainless steel spring threaded on to the arch produces a suitable activation for space opening. The canine is shown banded in this illustration, but of course the first premolar might equally well be used. B, Similar sectional arch used in conjunction with No. 4 or No. 6 elastics to produce space closure following loss of lower premolar. C, Showing the use of a removable appliance to reinforce the anchorage when this is considered necessary.

The fixed sectional appliances shown last involved the construction of canine (and/or premolar bands) and molar bands, in conjunction with palatal or lingual removable appliances to increase the anchorage potential where necessary. This method was found particularly suitable for those cases where a removable appliance was being inserted to commence movement in the opposing arch, and where it was desirable to start lower arch tooth movement as soon as possible, i.e., without having to await construction and fitting of all lower arch bands.

For example, as in the cases shown, recreating space for a lower second premolar (*Fig.* 2 A) and closing space following loss of a lower first premolar (*Fig.* 2 B), the construction and fitting of the necessary bands, sectional arches, etc., can be rapidly performed permitting an early start to active treatment. Should the anchorage prove inadequate, the appliance can be reinforced by a suitable removable appliance (*Fig.* 2 C), or, if necessary, by fitting of premolar and incisor bands so that the sectional arch "grows up" to become a full multi-band arch appliance.

The actual sectional arch is made of 0·016 in. or 0·018 in. stainless steel or Elgiloy type alloy wire, so that it has an adequate degree of flexibility whilst possessing the stability of a rectangular arch. The loop incorporated anteriorly permits adjustment to allow the two arms to pass easily through the ligature tubes of the canine or premolar bracket, and at the same time prevents it being a completely rigid joint. It can be used for looping elastics over for space closure or for holding the arch whilst feeding a space opening spring on to it, prior to passing the distal end through the molar buccal sheath. It is common practice to turn the free end of the shorter arm down to lock the arch and prevent it sliding out of the bracket. Most commonly No. 4 or No. 6 space-closing elastics are used, looped singly or doubled, whilst 0·7 × 0·15 mm. open stainless steel springs appear to provide a suitable range of activation for space opening.

Acknowledgements.—I wish to thank Professor C. F. Ballard of the Orthodontic Department, Eastman Dental Hospital, and Mr. W. A. Nicol, Consultant in Orthodontics to the Bristol Dental Hospital, for their help and permission to publish these appliances; also

Mr. F. D. Godman, of the University of Bristol Medical Photographic Department, for the illustrations.

REFERENCE

ADAMS, C. P. (1957), *The Design and Construction of Removable Orthodontic Appliances.* Bristol: John Wright & Sons Ltd.

A COIL SPRING RETRACTOR FOR REMOVABLE APPLIANCES

By **J. W. SOFTLEY**, B.D.S., F.D.S., D.Orth. R.C.S.

THE retraction of upper canines is one of the more common movements required in orthodontic practice. Removable appliances are particularly suitable for the purpose as anchorage problems are more easily overcome by taking advantage of the slope of the palate and by using an anterior guide plane.

However, the springs in general use so far are often difficult to adjust or require frequent adjustment, and some are easily distorted.

The coil spring provides a source of even pressure over a long range, and the appliance described is easily inserted and robust enough to withstand ordinary usage.

The pressure is exerted by a traveller activated by a coil spring. Rotation of the traveller is prevented by a welded loop (*Figs.* 1, 2).

If both canines are to be moved the coil works reciprocally on both teeth. Where one tooth only is to be moved a friction stop is used as suggested by Johnson.

The appliance can readily be adapted for canines which are placed high in the alveolus (*Fig.* 3). It can, of course, be applied to other teeth.

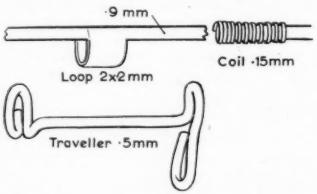

Fig. 1.—Diagram to show component parts of retractor.

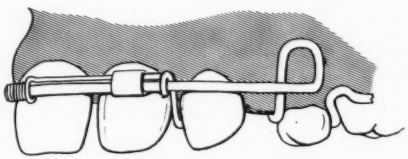

Fig. 2.—Retractor adapted for distal movement of $\underline{|3}$.

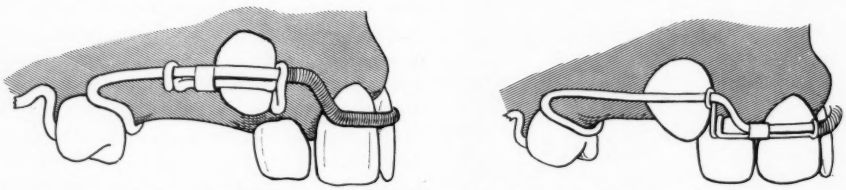

Fig. 3.—Alternative methods of adapting the appliance to highly placed teeth.

Practical points in construction are: Labial arch wire, 0·9 mm.; Coil spring, 0·15 mm. wound on 0·9 mm.; Traveller, 0·5 mm.; Welded loop, 2 × 0·2 mm.

The coil springs and travellers are assembled before processing, but it is convenient to add the loop when the plate is finished.

Friction stops must be added to the labial arch before bending.

The coil spring should not be extended at the ends.

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A demonstration given at the meeting held on May 9, 1960.